HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Wallace River Coho Program
Species or Hatchery Stock:	Wallace River Coho *(Onchorynchus kisutch)*
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Snohomish River Puget Sound
Date Submitted:	March 17, 2003
Date Last Updated:	March 17, 2003

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Wallace River Coho Program

1.2) Species and population (or stock) under propagation, and ESA status.

Wallace River Coho (*Oncorhynchus kisutch*) - not listed

1.3) Responsible organization and individuals

Name (and title):	Chuck Phillips, Region 4 Fish Program Manager Doug Hatfield, Snohomish Complex Manager	
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

This program is the brood source for the Tulalip Tribal coho program (1,300,000 eggs) as well as the Squaxin Tribal/South Sound net pen program. Miscellaneous schools and small coop projects receive eggs for educational purposes. The Seattle Poggie Club, Possession Net Pen and Mukilteo Net Pen also receive fish from Wallace River.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding for this program is provide through the State General Fund.

1.5) Location(s) of hatchery and associated facilities.

Wallace River Hatchery: Wallace River (07.0940) RM 4 at confluence with May Creek (07.0943)

1.6) Type of program.

Integrated harvest

1.7) Purpose (Goal) of program.

Augmentation

The goal of this program is to provide fish for harvest opportunity.

1.8) Justification for the program.

WDFW and the tribes shall conduct the proposed program in such a way as to assure that the genetic, ecological and demographic effects on the listed chinook salmon in the Puget Sound region do not appreciably reduce the likelihood of the survival and recovery of the Puget Sound chinook ESU.

1.9) List of program “Performance Standards”.

See below

1.10) List of program “Performance Indicators”, designated by "benefits" and "risks."

Performance Standards and Indicators for Puget Sound **Integrated Harvest** Coho programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measuring survivals by periodical CWT data.
Meet hatchery production goals	Number of juvenile fish released - **150,000**	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Document (FBD).
Manage for adequate escapement	Hatchery and wild return rates Catch rates	Monitoring hatchery/wild return rates through trapping (at the hatchery or at weir), redd and snorkel surveys on the spawning grounds plus catch records.

Minimize interactions with listed fish through proper broodstock management	Total number of broodstock collected - **3,200**	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery records.
	Sex ratios	Hatchery records and spawning guidelines.
	Timing of adult collection/spawning - **October to mid-December**	Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base.
	Number of listed fish passed upstream - **No summer chinook at time of coho collection/spawning**	Hatchery records.
	Hatchery stray rate	CWT data and spawning ground surveys
	Number wild fish used in broodstock - **Unknown in the past**	Hatchery records
	Return timing of wild/ hatchery adults - **June to mid-August (chinook) /October to mid-December (coho)**	Hatchery records
	Adherence to spawning guidelines - **see section 8.3**	Hatchery records and spawning guidelines.

Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	FBD and hatchery records
	Outmigration timing of listed fish / hatchery fish - **April-May (chinook) / May (coho)**	Hatchery records and historical natural out-migrant data
	Size and time of release - **17 fpp/May release**	FBD and hatchery records
	Hatchery stray rates	CWT data and mark / unmarked ratios of adults
Maintain stock integrity and genetic diversity	Effective population size	Spawning guidelines
	Hatchery-Origin Recruit spawners	Spawner surveys
Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Co-Managers Disease Policy Fish Health Exam Reports
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	

	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

3,200 adults for broodstock.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Wallace River (07.0940)	150,000

*- Since the 1995 BY, the programmed on-station release has been reduced from 300,000 to the present 150,000 release.

**-also provide 1,700,000 eggs to the Marblemount Hatchery (Squaxin tribal/South Sound net pen program), 1,300,000 eggs to the Tulalip Tribe and numerous co-op and educational programs in area.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Between broodyears 1988 and 1997, the average smolt-to-adult survival rate was 7.90%. The escapement levels back to the hatchery from 1995 through 2001 have been 28,643, 17,842, 19,262, 17,880, 8,501, 26,265 and 32,518, respectively.

1.13) Date program started (years in operation), or is expected to start.

1920's

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Snohomish River watershed (WRIA 07)
- Skykomish River (07.0012)
- Wallace River (07.0940)

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

None

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

None

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Snohomish summer chinook spawning in the upper Snohomish and Skykomish basins. This is a native stock that has been classified as depressed due to chronic low escapements (1992 SASSI)

Other Snohomish Basin Chinook populations:
1) Wallace River summer/fall chinook which spawns in the Wallace River. It is a composite stock that has been classified as healthy (1992 SASSI)
2) Snohomish fall chinook stock which spawns in the Snoqualmie basin as well as the Pilchuck River, Sultan River, Woods Creek and Elwell Creek. It is considered to be a native stock and has been classified as depressed due to low escapement trends (1992 SASSI)
3) Bridal Veil Creek Fall Chinook stock spawns in the south fork Skykomish River, including Bridal Veil Creek, as well as the North Fork Skykomish up to Bear Creek (RM 13.1). It is considered to be native and its stock status is classified as unknown (1992 SASSI).

Skykomish Bull Trout:
1) A single stock that spawns in the south fork Skykomish River including West Cady Creek, Goblin Creek, Troublesome Creek, Salmon Creek and the east fork Foss Creek, tributaries to the south fork Skykomish River. This stock is considered to be a native stock that has been classified as healthy based on increasing escapement trends (1998 SASSI bull trout and Dolly Varden appendix).

2.2.2) <u>Status of ESA-listed salmonid population(s) affected by the program.</u>

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds

Critical and viable population threshholds under ESA have not yet been determined. SASSI designations are stated in 2.2.1 above.

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

1.358 : 1 for 1990 to 1999 for chinook

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Recent Escapements: (composite of summer and fall run chinook)

1989	3138
1990	4209
1991	2783
1992	2708
1993	3866
1994	3626
1995	3176

1996	4851
1997	4292
1998	6304
1999	4790
2000	6092

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Unknown

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

The release of fish as described in this HGMP could potentially result in ecological interactions with listed species. These potential ecological interactions are discussed in Section 3.5, and risk control measures are discussed in Section 10.11. Implementation of the program modifications provided in this HGMP, and the actions previously taken by the comanagers, are anticipated to contribute to the continued improvement in the abundance of listed salmonids(yearling coho production at Wallace River has been reduced from 300,000 to 150,000 recently).

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.

Unknown

Provide projected annual take levels for listed fish by life stage (juvenile and adult). quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See "take" table.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

There are no ESU-wide hatchery plans or other regionally accepted policies currently in place.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Eggs and fish are provided to the Tulalip Tribe as defined in the Future Brood Document. In addition, Wallace River coho are shipped to the Squaxin Tribal net pens for rearing and release.

3.3) Relationship to harvest objectives.

Wallace River coho contribute to the US and Canadian marine sport and commercial fisheries, Snohomish River sport fishery and the Tulalip Tribal fishery.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

See 3.3

3.4) Relationship to habitat protection and recovery strategies.

The comanagers' resource management plans for artificial production in Puget Sound are expected to be one component of a recovery plan for Puget Sound chinook under development through the Shared Strategy process. Several important analyses have been completed, including the identification of populations of Puget Sound chinook, but further development of the plan may result in an improved understanding of the habitat, harvest, and hatchery actions required for recovery of Puget Sound chinook.

3.5) Ecological interactions.

The program described in this HGMP interacts with the biotic and abiotic components of the freshwater, estuarine, and marine salmonid ecosystem through a complex web of short and longterm processes. The complexity of this web means that secondary or tertiary interactions (both positive and negative) with listed species could occur in multiple time periods, and that evaluation of the net effect can be difficult. WDFW is not aware of any studies that have directly evaluated the ecological effects of this program.

Alternatively, we provide in this section a brief summary of empirical information and theoretical analyses of three types of ecological interactions, nutrient enhancement, predation, and competition, that may be relevant to this program. Recent reviews by Fresh (1997), Flagg et al. (2000), and Stockner (2003) can be consulted for additional information; NMFS (2002) provides an extensive review and application to ESA permitting of artificial production programs.

Nutrient Enhancement
Adults originating from this program that return to natural spawning areas may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

Predation – Freshwater Environment
Coho and steelhead released from hatchery programs may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs, and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). The site specific nature of predation, and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of any specific hatchery program. WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP.

In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented. Risk factors for evaluating the potential for significant predation include the following:

Environmental Characteristics. Water clarity and temperature, channel size and configuration, and river flow are among the environmental characteristics that can influence the likelihood that predation will occur (see SWIG (1984) for a review). The SIWG (1984) concluded that the potential for predation is greatest in small streams with flow and turbidity conditions conducive to high visibility.

Relative Body Size. The potential for predation is limited by the relative body size of fish released from the program and the size of prey. Generally, salmonid predators are thought to prey on fish approximately 1/3 or less their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length (Pearsons et al. 1998). The lengths of juvenile migrant chinook salmon originating from natural production have been monitored in numerous watersheds throughout Puget Sound, including the Skagit River , Stillaguamish River, Bear Creek, Cedar River, Green River, Puyallup River, and Dungeness River. The average size of migrant chinook salmon is typically 40mm or less in February and March, but increases in the period from April through June as emergence is completed and growth commences (Table 3.5.1). Assuming that the prey item can be no greater than 1/3 the length of the predator, Table 3.5.1 can be used to determine the length of predator required to consume a chinook salmon of average length in each time period. The increasing length of natural origin juvenile chinook salmon from March through June indicates that delaying the release hatchery smolts of a fixed size will reduce the risks associated with predation.

Table 3.5.1. Average length by statistical week of natural origin juvenile chinook salmon migrants captured in traps in Puget Sound watersheds. The minimum predator length corresponding to the average length of chinook salmon migrants, assuming that the prey can be no greater than 1/3 the length of the predator, are provided in the final row of the table. (NS: not sampled.)

Watershed	Statistical Week										
	16	17	18	19	20	21	22	23	24	25	26
Skagit [1] 1997-2001	43.2	48.3	50.6	51.7	56.1	59.0	58.0	60.3	61.7	66.5	68.0
Stillaguamish [2] 2001-2002	51.4	53.5	55.7	57.8	60.0	62.1	64.2	66.4	68.5	70.6	72.8
Cedar [3] 1998-2000	54.9	64.2	66.5	70.2	75.3	77.5	80.7	85.5	89.7	99.0	113
Green [4] 2000	52.1	57.2	59.6	63.1	68.1	69.5	NS	79.0	82.4	79.4	76.3
Puyallup [5] 2002	NS	NS	NS	66.2	62.0	70.3	73.7	72.7	78.7	80.0	82.3
Dungeness [6] 1996-1997	NS	NS	NS	NS	NS	NS	NS	NS	77.9	78.8	81.8
All Systems Average Length	50.4	55.8	58.1	61.8	64.3	67.7	69.2	72.8	76.5	79.0	82.4
Minimum Predator Length	153	169	176	187	195	205	210	221	232	239	250

Sources:

[1] Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002)..

[2] Data are from regression models presented in Griffith et al. (2001) and Griffith et al. (2003).

[3] Data are from Seiler et al. (2003).

[4] Data are from Seiler et. (2002).
[5] Data are from Samarin and Sebastian (2002).
[6] Data are from Marlowe et al. (2001).

Date of Release. The release date of juvenile fish for the program can influence the likelihood that listed species are encountered or are of a size that is small enough to be consumed. The most extensive studies of the migration timing of naturally produced juvenile chinook salmon in the Puget Sound ESU have been conducted in the Skagit River, Bear Creek, Cedar River, and the Green River. Although distinct differences are evident in the timing of migration between watersheds, several general patterns are beginning to emerge:

1) Emigration occurs over a prolonged period, beginning soon after enough emergence (typically January) and continuing at least until July;
2) Two broad peaks in migration are often present during the January through July time period; an early season peak (typically in March) comprised of relatively small chinook salmon (40-45mm), and a second peak in mid-May to June comprised of larger chinook salmon;
3) On average, over 80% of the juvenile chinook have migrated past the trapping locations after statistical week 23 (usually occurring in the first week of June).

Table 3.5.2. Average cumulative proportion of the total number of natural origin juvenile chinook salmon migrants estimated to have migrated past traps in Puget Sound watersheds.

Watershed	Statistical Week										
	16	17	18	19	20	21	22	23	24	25	26
Skagit [1] 1997-2001	0.61	0.64	0.68	0.73	0.76	0.78	0.83	0.86	0.90	0.92	0.94
Bear [2] 1999-2000	0.26	0.27	0.28	0.32	0.41	0.52	0.73	0.84	0.92	0.96	0.97
Cedar [2] 1999-2000	0.76	0.76	.0.76	0.77	0.79	0.80	0.82	0.84	0.87	0.88	0.90
Green [3] 2000	0.63	0.63	0.64	0.69	0.77	0.79	0.84	0.86	0.88	0.98	1.00
All Systems Average	0.56	0.58	0.59	0.63	0.68	0.72	0.80	0.85	0.89	0.94	0.95

Sources:
[1] Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002)..
[2] Data are from Seiler et al. (2003).
[3] Data are from Seiler et. (2002).

Release Location and Release Type. The likelihood of predation may also be affected by the location and type of release. Other factors being equal, the risk of predation may increase with the length of time the fish released from the artificial production program are commingled with the listed species. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release, and the speed at which fish released from the program migrate from the watershed.

Coho salmon and steelhead released from western Washington artificial production programs as smolts have typically been found to migrate rapidly downstream. Data from Seiler et al. (1997; 2000) indicate that coho smolts released from the Marblemount Hatchery on the Skagit River migrate approximately 11.2 river miles day. Steelhead smolts released onstation may travel even more rapidly – migration rates of approximately 20 river miles per day have been observed in the Cowlitz River (Harza 1998). However, trucking fish to offstation release sites, particularly release sites located outside of the watershed in which the fish have been reared, may slow migrations speeds (Table 3.5.3).

Table 3.5.3. Summary of travel speeds for steelhead smolts for several types of release strategies.

Location	Release Type	Migration Speed (river miles per day)	Source
Cowlitz River	Smolts, onstation	21.3	Harza (1998)
Kalama River	Trucked from facility located within watershed in which fish were released.	4.4	Hulett (pers. comm.)
Bingham Creek	Trucked from facility located outside of watershed in which fish were released.	0.6	Seiler et. al. (1997)
Stevens Creek	Trucked from facility located outside of watershed in which fish were released.	0.5	Seiler et. al. (1997)
Snow Creek	Trucked from facility located outside of watershed in which fish were released.	0.4	Seiler et. al. (1997)

Number Released. Increasing the number of fish released from an artificial production program may increase the risk of predation, although competition between predators for prey may eventually limit the total consumption (Peterman and Gatto 1978).

Predation – Marine Environment

WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP. NMFS (2002) reviewed existing information on the risks of predation in the marine environment posed by artificial production programs and concluded:

"1) Predation by hatchery fish on natural-origin smolts or sub-adults is less likely to occur than predation on fry. Coho and chinook salmon, after entering the marine environment, generally prey upon fish one-half their length or less and consume, on average, fish prey that is less than one-fifth of their length (Brodeur 1991). During early marine life, predation on natural origin chinook, coho, and steelhead will likely be highest in situations where large, yearling-sized hatchery fish encounter sub-yearling fish or fry (SIWG 1984)."

"2) However, extensive stomach content analysis of coho salmon smolts collected through several studies in marine waters of Puget Sound, Washington do not substantiate any indication of significant predation upon juvenile salmonids (Simestad and Kinney 1978)."

"3) Likely reasons for apparent low predation rates on salmon juveniles, including chinook, by larger chinook and other marine predators are described by Cardwell and Fresh (1979). These reasons included: 1) due to rapid growth, fry are better able to elude predators and are accessible to a smaller proportion of predators due to size alone; 2) because fry have dispersed, they are present in low densities relative to other fish and invertebrate prey; and 3) there has either been learning or selection for some predator avoidance."

Competition

WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids."
2) NMFS (2002) noted that "..where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat

and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

The Wallace River and May Creek are the two sources of water used for incubating and rearing coho at Wallace River Hatchery. Both of these are surface water in origin. Both sources exhibit similar temperature profiles ranging from the mid 30°s to the upper 60°s Fahrenheit. They are small streams that are subject to rapid changes in flow and height especially during the winter flood months. Water for the hatchery is pumped from both sources: The Wallace River can provide as much as 12,000 gallons per minute (gpm). 5,800 gpm is available from May Creek. The facility is covered under NPDES permit # WAG 133006

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

The facility has two intake structures, one on May Creek the other on the Wallace River. Chinook are not passed above the May Creek intake. The May Creek intake has 1" x .125" screen and is believed to be compliant. The Wallace River Intake screens have recently been replaced with compliant mesh. Chinook are passed above the Wallace River intake.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Wallace River Hatchery has two adult collection facilities. The first is an instream trap located on May Creek. The trap measures 70' at its widest point and is 110' in length. There are 2 step-type ladders located on the lower end of the trap and a picket-type rack is located at the upper end of the pond. The trap is dependent on the natural flow of May Creek for its water supply. The second trapping facility consists of a series of three 100' X 20' X 6' adult capture ponds. A weir is placed across the Wallace River the first week in June and remains in place until October 1st. Water is pumped from the Wallace River for these ponds. After the adult capture season ends (December), these ponds are populated with yearling coho until their release in May.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

NA

5.3) Broodstock holding and spawning facilities.

Coho broodstock are held in the three adult capture ponds (100' X 20' X 6') until spawning. Spawning facilities are located at ends of these ponds.

5.4) Incubation facilities.

The incubation facility at Wallace River consists of 1,152 "Heath" style vertical incubators. These incubators are supplied with 4 gpm of water from May Creek.

5.5) Rearing facilities.

There are 3 types of rearing vessels used at Wallace River: 6 - 100' X 10' X 4' raceways, 4 - 80' X 20' X 4' standard ponds and 3 - 1000' X 28' X 5' rearing channels. Typically fry are ponded in either the raceways or standard ponds and reared until they reach 400 fish per pound (fpp). At this point the fish are transferred to the rearing channels for the rest of the rearing period and eventual release. The program goal for release is the first week of May with a size target of 16-18 fpp.

5.6) Acclimation/release facilities.

Fish are acclimated on May Creek and/or Wallace River water their entire time in the hatchery. See section 5.5

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

Because surface water is the source for the hatchery, the threats from diseases and parasites present the most significant threat to fish health. Additionally, electrical power is required to supply water to the ponds therefore the loss of power also presents a constant threat.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied,

that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Wallace River Hatchery is staffed with five full time employees, one of which is in standby status 24 hours a day seven days a week. All staff are very familiar with the workings of the hatchery and have received training in fish cultural techniques and disease recognition and prevention issues. Additionally, fish health staff make frequent visits to the hatchery to check the health of fish stocks and are available immediately in case of a disease outbreak. The hatchery is equipped with a sophisticated alarm system that monitors flow and other conditions critical to hatchery operations. There is a standby power generator capable of supplying all of the electrical needs of the hatchery in case of a loss of power.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Adult coho returning to the Wallace River Hatchery between October 1st and December 15th are used as the coho broodstock.

6.2) Supporting information.

6.2.1) History.

The origin of the broodstock at Wallace River Hatchery is the Skykomish River.

6.2.2) Annual size.

3,200 adults.

6.2.3) Past and proposed level of natural fish in broodstock.

The past level of wild broodstock is unknown, but in the future, with the advent of mass marking, only hatchery-origin coho broodstock will be utilized.

6.2.4) Genetic or ecological differences.

None known.

6.2.5) Reasons for choosing.

Local native stock.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

NA

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults.

7.2) Collection or sampling design.

See section 5.1.

7.3) Identity.

Adipose-fin clipped hatchery-origin fish.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

3,200 adults are collected for the purpose of spawning.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995	3,381	1,451	6	6,417,000	
1996	2,737	2,177	34	6,176,500	
1997	2,666	2,380	12	5,880,800	
1998	1,996	842	0	5,195,182	

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1999	1,563	1,563	3	4,129,600	
2000	Data Inc.	Data Inc.	Data Inc.	Data Inc.	
2001	1,195	873	1	#'s not found	

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Surplus fish are handled in various ways. First consideration is to return excess fish to the river when appropriate. Excess fish not returned to the river are either donated to food banks, sold to a contracted buyer or the carcasses are placed back in the streams as a means of nutrient enhancement.

7.6) Fish transportation and holding methods.

NA

7.7) Describe fish health maintenance and sanitation procedures applied.

Adult broodstock are sampled for virus in accordance with the Co-Managers Disease Policy and spawning procedures follow the guidelines set forth in the hatchery division Fish Health Manual.

7.8) Disposition of carcasses.

Spawned and unspawned carcasses that have not been exposed to antibiotics or chemical treatment are typically sold to a fish buyer, otherwise all carcasses are buried on station.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

NA

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Adult coho are selected randomly over the entire run.

8.2) Males.

No back up males or repeat spawners are used. Jacks are spawned at a rate of 2% over the spawning season

8.3) Fertilization.

Equal sex ratios are used and gametes are pooled in lots of 5.

8.4) Cryopreserved gametes.

NA

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

NA

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1 Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Typical survival from spawn to eyed egg is 95%.

9.1.2) Cause for, and disposition of surplus egg takes.

Current management approaches do not allow for the taking of eggs in surplus of program goals. If losses are too high, then goals are not met.

9.1.3) Loading densities applied during incubation.

9,000 eggs per tray.

9.1.4) Incubation conditions.

Temperature of inflowing water is monitored and recorded daily. Dissolved oxygen is checked on an infrequent basis and silt management is accomplished by rodding the trays and brushing tray screens. Since this is a surface water source, siltation is dealt with on a frequent basis and during flood events the incubators sometimes need constant attention.

9.1.5) Ponding.

See section 5.5.

9.1.6) Fish health maintenance and monitoring.

The fish are cared for on a daily basis by trained hatchery specialists. In addition the fish are examined regularly by a Fish Health Specialist.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

NA

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

9.2.2) Density and loading criteria (goals and actual levels).

Numerous criteria are applied depending on the fish's size, the pond style they reside in, water quality, water temperature, relative health and water conditions. However, as a rule, the criteria limits loadings to a maximum of 3 pounds fish/gpm of flow until they have reached a size of 100 fpp.

9.2.3) Fish rearing conditions

Water temperatures are monitored on a daily basis. Water flows are checked at least weekly. Each pond is monitored for loss and loss is picked daily. Ponds are vacuumed on an as-needed basis (typically weekly). General health of the fish is monitored by Fish Health staff on a biweekly basis.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Not available.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency

during rearing (*average program performance*).

Diets are supplied by Moore-Clark and BioOregon. The diets are typically "dry" or "semi-dry" in nature and included starter diets, crumbles and pellet type feeds. Daily percent of body weight fed varies depending on the size of the fish, temperature of the water and time of year. However, the range is usually from 1-3% B.W./day. Overall food conversion is typically 1.1 to1.2.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Sanitation procedures include the use of iodophore solutions as disinfectant for tools and nets and other equipment used between ponds and stocks of fish. Fish Health staff monitor the fish on a biweekly basis and disease treatment is done on an as-needed basis.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

NA

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

NA

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

NA

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	150,000	17	May	Wallace River

10.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse: Wallace River (07.0940)
Release point: Wallace River Hatchery (RM 4)

Major watershed: Snohomish River
Basin or Region: Puget Sound

10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995							303,900	18
1996							303,000	18
1997							309,000	19
1998							269,000	16
1999							302,005	17
2000							373,045	19
2001							155,345	18
Average							287,899	18

10.4) Actual dates of release and description of release protocols.

Fish are released during the month of May and are forced from the ponds. Program has been reduced from 300,000+ to 150,000 on-station release.

10.5) Fish transportation procedures, if applicable.

NA

10.6) Acclimation procedures.

Incubated and reared on the same water source (river) prior to release.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All coho will be 100% identified with an adipose-fin clip (mass marked). In addition, 45,000 are coded-wire tagged only and 45,000 are adipose fin clipped/ coded-wire tagged as a "double index" tag group.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

None. All surplus fish would be identified at time of clipping and disposed of then.

10.9) Fish health certification procedures applied pre-release.

Fish Health staff evaluates the fish a maximum of 2 weeks prior to release.

10.10) Emergency release procedures in response to flooding or water system failure.

In the case of a catastrophic event conditions critical to the fishes health would be monitored and if deemed necessary the fish would be released prematurely to prevent their loss in the ponds.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

To minimize the risk of residualization and impact upon natural fish, hatchery yearlings are released in May as smolts. All fish released will be mass marked.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The comanagers conduct numerous ongoing monitor programs, including catch, escapement, marking, tagging, and fish health testing. The focus of enhanced monitoring and evaluation programs will be on the risks posed by ecological interactions with listed species. WDFW is proceeding on four tracks:

1) An ongoing research program conducted by Duffy et al. (2002) is assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon, and potential predators and competitors, in northern and southern Puget Sound. Funding is provided through the federal Hatchery Scientific Review Group.

2) A three year study of the estuarine and early marine use of Sinclair Inlet by

juvenile salmonids is nearing completion. The project has four objectives:

a) Assess the spatial and temporal use of littoral habitats by juvenile chinook throughout the time these fish are available in the inlet;

b) Assess the use of offshore (i.e., non-littoral) habitats by juvenile chinook;

c) Determine how long cohorts of juvenile chinook salmon are present in Sinclair inlet;

d) Examine the trophic ecology of juvenile chinook in Sinclair Inlet. This will consist of evaluating the diets of wild chinook salmon and some of their potential predators and competitors. Funding is provided by the USDD-Navy.

3) WDFW is developing the design for a research project to assess the risks of predation on listed species by coho salmon and steelhead released from artificial production programs. Questions which this project will address include:

a) How does trucking and the source of fish (within watershed or out of watershed) affect the migration rate of juvenile steelhead?

b) How many juvenile chinook salmon of natural origin do coho salmon and steelhead consume?

c) What is the rate of residualism of steelhead in Puget Sound rivers?

Funding needs have not yet been quanitifed, but would likely be met through a combination of federal and state sources.

4) WDFW is assisting the Hatchery Scientific Review Group in the development of a template for a regional monitoring plan. The template will provide an integrated assessment of hatchery and wild populations.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

See Section 11.1.1.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Risk aversion measures will be developed in conjunction with the monitoring and evaluation plans.

SECTION 12. RESEARCH

12.1) Objective or purpose.

There is currently no research being conducted using Wallace River coho.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

12.8) Expected type and effects of take and potential for injury or mortality.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

12.10) Alternative methods to achieve project objectives.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook ESU/Population: Puget Sound Activity: Hatchery operation				
Location of hatchery activity: Wallace River Dates of activity: October-May Hatchery program operator: WDFW				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)	Unknown	Unknown		
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.